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# Bi-jaw Surgical Correction of Skeletal Class III Malocclusion with Anterior Open Bite using "Minimal Presurgical Orthodontic" Approach: a Case Report

**Harshikkumar Arvindbhai Parekh[1*], Rahul Anil Trivedi[1], Falguni Mehta[2], Renuka Patel[3], Nipa Prajapati[1], Shekhar Asarsa[4]**

[1] MDS Orthodontics, Assistant Professor, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad-380016, Gujarat, India
[2] MDS Orthodontics, Professor & Head, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad-380016, Gujarat, India
[3] MDS Orthodontics, Professor, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad-380016, Gujarat, India
[4] Ex PG Student, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad-380016, Gujarat, India

***Corresponding author:** Harshikkumar Arvindbhai Parekh, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad-380016, Gujarat, India.

Email: harshikp@yahoo.com

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**Abstract**

**Background**: Traditional orthognathic surgery typically requires prolonged and extensive orthodontic treatment prior to surgery, followed by a shorter postoperative orthodontic phase. The pre-surgical orthodontic period is lengthy and can lead to a decline in facial aesthetics due to decompensation. Consequently, patients' mental health could decline and they could lose confidence as a result of these changes. To address the issue of deteriorating facial soft tissues during early decompensation and to reduce the risk of unstable postoperative occlusion, the surgery-first approach (SFA) or minimal presurgical orthodontics (MPO) has been introduced. MPO is designed to minimize occlusal interference and enhance arch coordination for surgery, thereby increasing the predictability of surgical outcomes.
**Case Description**: An 18-year-old male patient with skeletal class III malocclusion and an anterior open bite was treated using MPO. A modified transpalatal arch (TPA) was applied before surgery to rectify a projected post-surgical buccal scissor bite involving the maxillary second molar. After achieving this correction, the patient underwent bi-jaw surgery.
**Conclusion**: This approach, in contrast to the conventional method, involved brief orthodontic tooth movement without negatively impacting the patient's profile or decompensation. The patient was highly satisfied and delighted with the outcome.

*Keywords:* Minimal presurgical orthodontics (MPO), Skeletal Class III, Open bite.

## 1. Background

With the introduction of orthognathic surgery in the 1960s, surgeons initially were following a surgery-first approach to address all skeletal discrepancies without presurgical orthodontic interventions (1). This approach was not without problems like unstable postoperative occlusion leading to severe masticatory problems and relapse (2-4). Surgeons and orthodontists eventually realized that dental compensations needed to be corrected for optimal positioning of the jaws with surgery. Hence, first applying the orthodontic approach became widely accepted to treat skeletal discrepancies, and reasonably stable occlusion and satisfactory treatment outcomes were achieved (5). Conventional orthognathic surgery involves presurgical extensive and lengthy orthodontic treatment followed by surgery and short postsurgery orthodontics. The orthodontic presurgical phase is longer and decompensation can lead to

worsening of facial esthetics (6,7). Patients do not like such changes and become anxious and tend to lose their confidence.

Recently, the surgery-first approach (SFA) also referred to as minimal presurgical orthodontics (MPO) has been introduced to overcome problems of worsening of facial soft tissues in the early phase of decompensation and to decrease chances of unstable postoperative occlusion. MPO is suggested to minimize occlusal interference and arch coordination for surgery to increase the predictability of surgical results (8,9,10). This case report illustrates a skeletal class III malocclusion in a young adult treated with MPO and bi-jaw surgical intervention.

## 2. Case Description

An 18-year-old male presented with the chief complaint of forwardly placed lower jaw and inability to cut from the front teeth (Fig.1). His family and medical history was nonsignificant and dental history revealed amalgam fillings in lower molars on both sides.

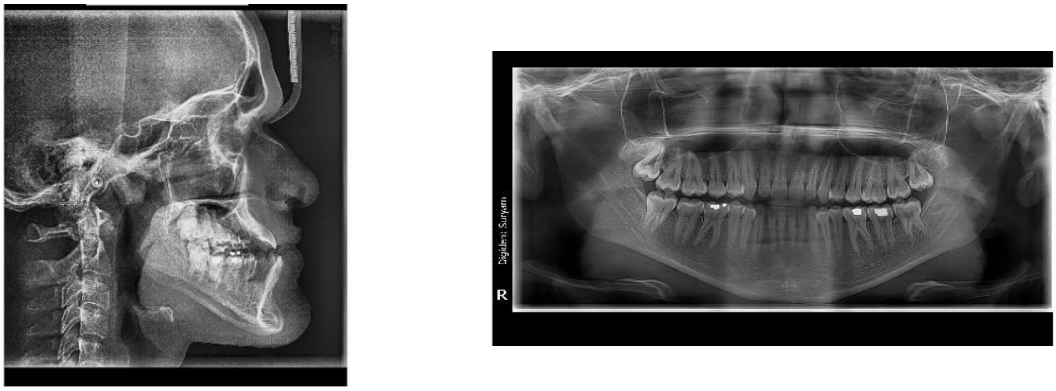


**Figure 1.** An 18-year-old male patient with skeletal class III malocclusion pre-treatment

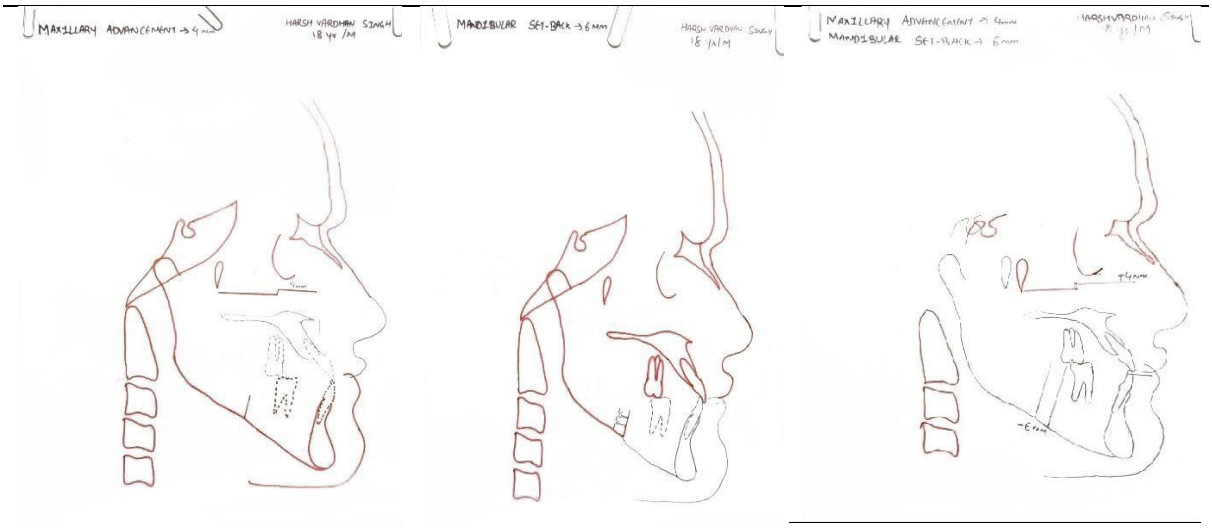



**Figure 2.** Surgical prediction on cephalometric

***Photographic Analysis***

Profile of the soft tissue analysis suggested maxillary hypoplasia, malar deficiency, and a concave profile with marked mandibular prognathism. The front face depicted an oval outline with an increased lower 2/3. Smile analysis revealed a non-consonant smile arc, decreased upper incisor display along with the absence of an overbite. Intraorally, both molars were in Angle's class III along with class III canines bilaterally. Both the arches were reasonably aligned; however, mild crowding, and both upper second molars were in the buccal scissor-bite. Midlines were matching with the facial midline. There was a reverse overjet of 6 mm and 3 mm of open bite. All third molars were present intraorally in all quadrants.

***Cephalometric Analysis***

Analysis showed a severe skeletal class III pattern (ANB -7°, Beta Angle 50°) due to maxillary hypoplasia (SNA 78°) and mandibular prognathism (SNB 85°). Maxillary incisors were proclined and forwardly placed (U1 to NA 34° and 9 mm). Mandibular incisors were slightly retroclined (L1 to NB 24° and 5mm, IMPA 82°). Both upper and lower incisors were naturally compensated for true skeletal class III.

***Treatment Objectives***

To correct skeletal discrepancy and facial concavity and achieve skeletal class I

To achieve smile consonance and improve facial esthetics

To achieve and maintain Angle's class I molars and canines bilaterally

To level and align the arches and achieve ideal overjet and overbite

Overall objectives were to have proper function and stability along with aesthetics.

***Treatment Progress***

The patient was given the following options:

1) Conventional orthodontic and orthognathic treatment

2) Minimum pre-surgical orthodontics

The patient did not desire to have a worsening of his facial appearance and preferred to have a positive change in his appearance as early as possible. Therefore, it was proposed to go for minimal orthodontics followed by surgery at the earliest time possible. Hence, the whole treatment consisted of three stages: 1) minimum presurgical orthodontics, 2) the surgical phase, and 3) post-surgical orthodontics.

Immediately after preparing the records, the patient was sent for the removal of all wisdom teeth. Upper and lower models were articulated as per surgical planning based on the cephalometric surgical treatment objective (STO) (Fig. 2) before commencing any treatment in the patient. This task was carried out to check for any occlusal interference that could potentially compromise the stability of the surgical procedure. Palatal cusps of upper second molars on both sides were extruded, which were major areas of fulcrum and made the occlusion unstable on the articulated models. Hence, it was required to correct occlusal interference as part of the minimum presurgical orthodontic procedure before undergoing orthognathic surgery. A modified transpalatal arch (TPA) (Fig. 3) was delivered and cemented to correct extruded palatal cusps of second maxillary molars. An E-chain was stretched from the buccal tubes of the molar bands to the extended wire of the modified TPA on the palatal side.

**Figure 3.** Modified TPA constructed with 0.9 mm stainless steel wire.

After correction of the maxillary molars inclination, both the arches were bonded with brackets (MBT 0.022), and 0.016" nitinol wires were placed. On the fifteenth day, the patient was taken for surgery. Kobayashi hooks were made from 0.09" SS ligature wire and ligated around the brackets to facilitate elastics usage. The patient showed 6 mm of reverse overjet. STO and mock surgery (Fig. 4) on the articulated models suggested a sagittal correction of 8 mm that included 2 mm for positive overjet. Sagittal 10 mm jaw movements were planned, keeping some relapse into consideration, and movements were divided into 4 mm maxillary forward and 6 mm mandibular setback movement. Two surgical splints, intermediate and final, were prepared as guides during surgery (Fig. 5). Surgical procedures consisted of Le Fort I osteotomy for maxillary advancement and bilateral sagittal spilt osteotomy for mandibular set back with counterclockwise rotation and settling into normal overbite (Fig. 6). The post-surgical orthodontic phase was initiated after 15 days of surgery. This phase involved leveling, alignment, decompensation, and settling of the occlusion (Fig. 7 and 8) with subsequent wires and elastics. Wire progression was until 0.019" × 0.025" SS. The patient was given a chin cup to wear at night immediately after surgery (Fig. 9).

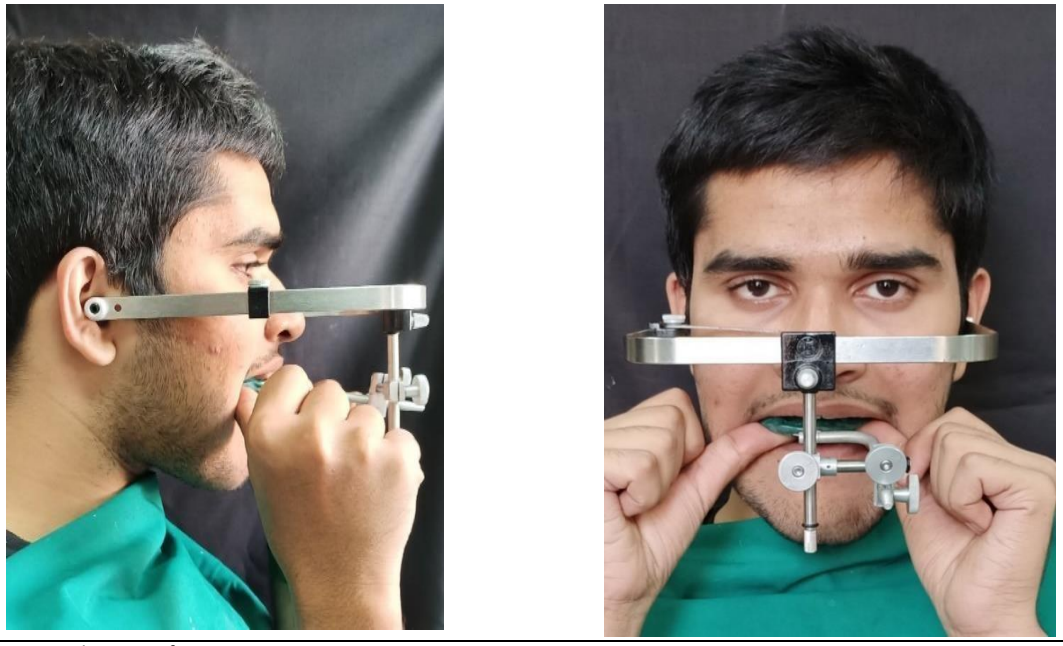
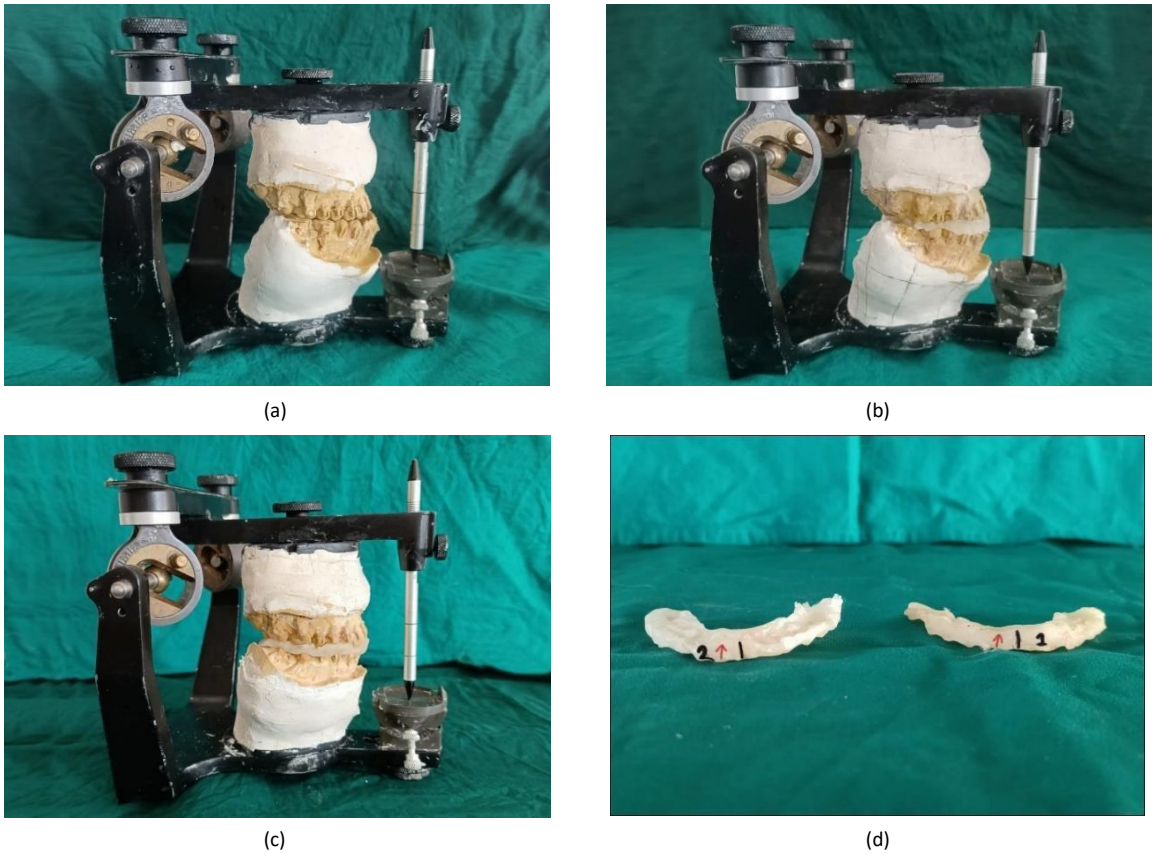


**Figure 4.** A Face bow transfer



(a) (b)

(c) (d)

**Figure 5.** Mock Surgery (a) Articulated models (b) Maxillary advancement and splints in place (c) Final splint after mandibular setback (d) Surgical Splint

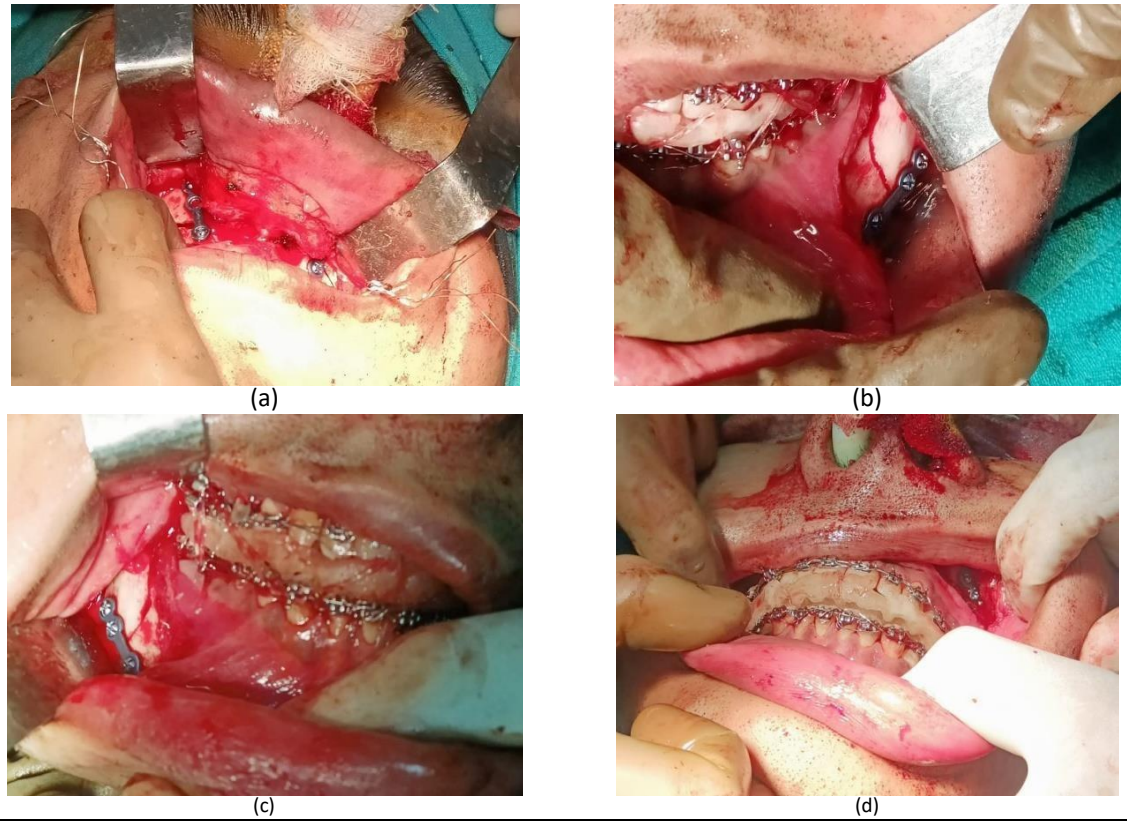


**Figure 6. (a).** Le Fort I osteotomy **(b and c).** Bilateral sagittal spilt osteotomy (d). Final splint in place

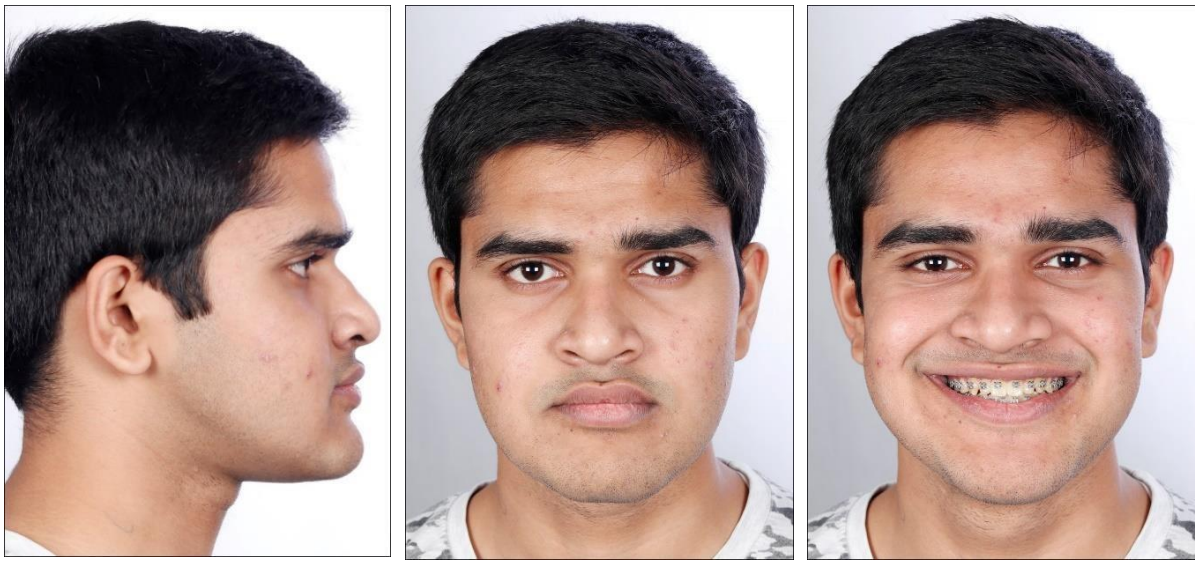


**Figure 7**. Extraoral postsurgery photographs

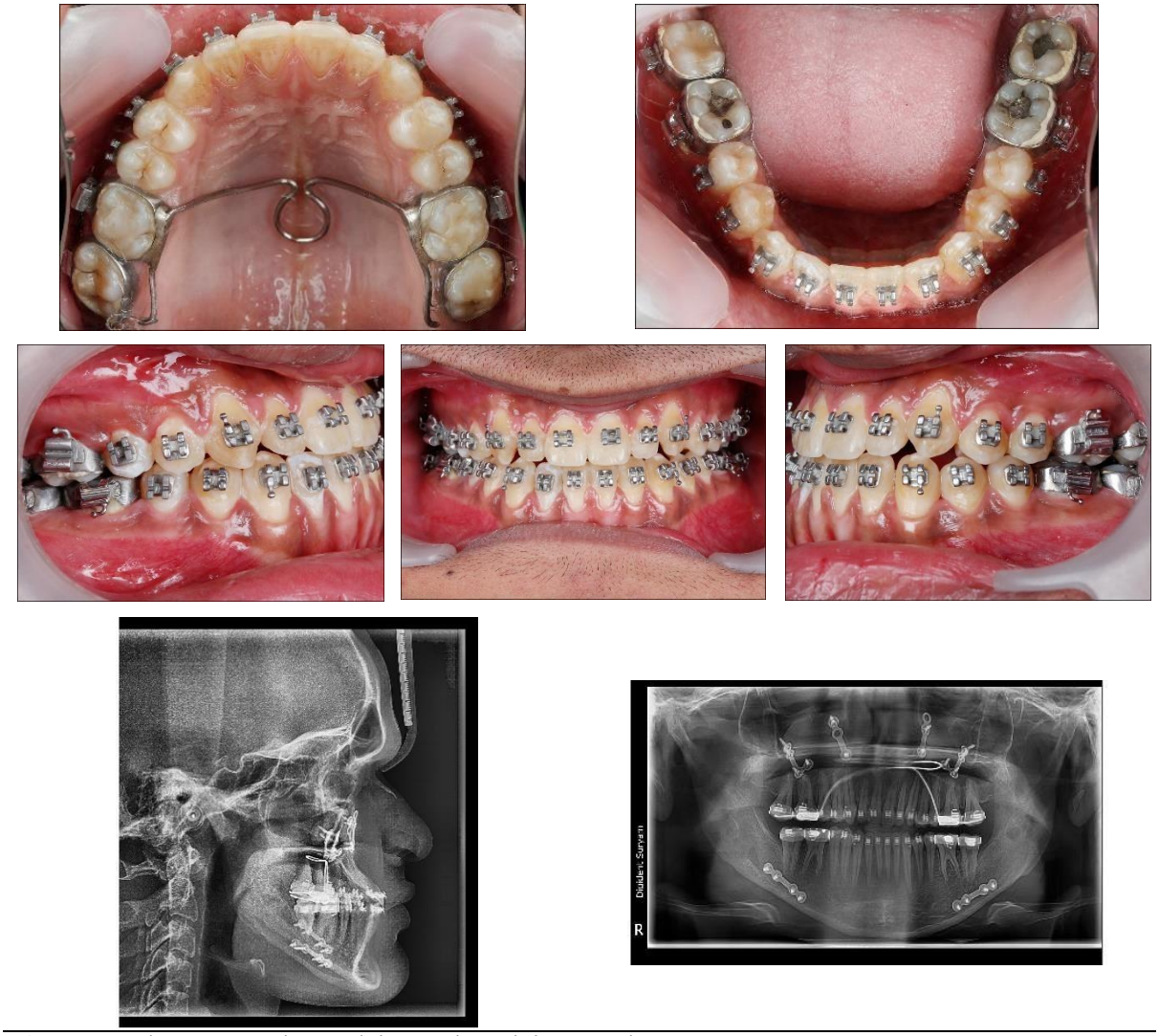


**Figure 8.** Immediate postsurgical intraoral photographs, cephalogram, and OPG

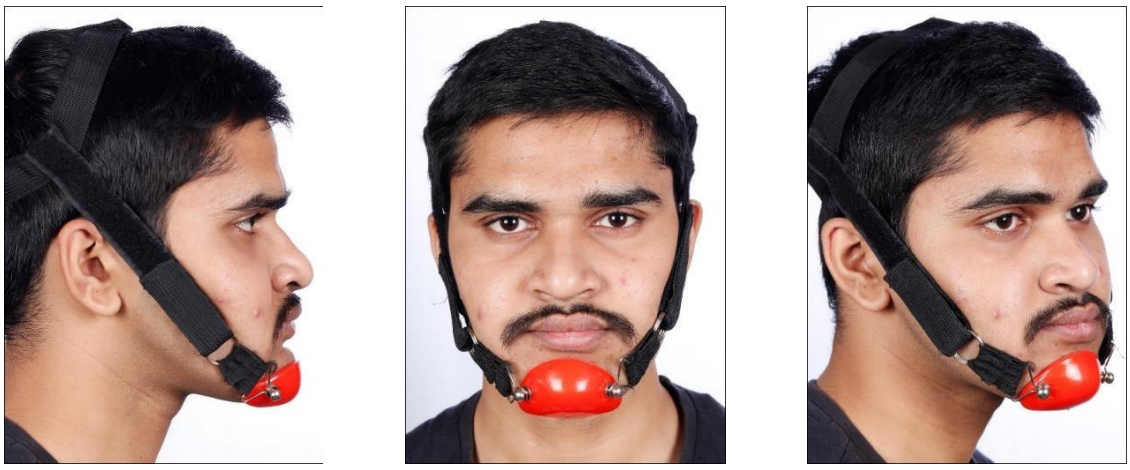


**Figure 9.** Chin-cap for night time wea

## 3. Results

There was a marked improvement in the patient's facial profile. Molar and maxillary deficiency, mandibular prognathism, and anterior open bite were corrected. A consonant smile arc was also achieved. Intraorally, the patient displayed class I canines and molars with normal overjet and

overbite (Fig.10). Cephalometric readings (Table 1) showed marked improvement of the ANB from -7° to 3° attributed to improvement in the SNA (from 78° to 82°) and SNB (from 85° to 79°). The patient was immensely delighted with the final outcomes. The superimpositions (Fig. 12 and 13), in both cephalometric and photographic reports, revealed significant improvement in the soft and hard tissues. The patient did not show any TMJ symptoms and no TMJ changes were found on the radiograph. The whole treatment was completed within a 12-month duration.

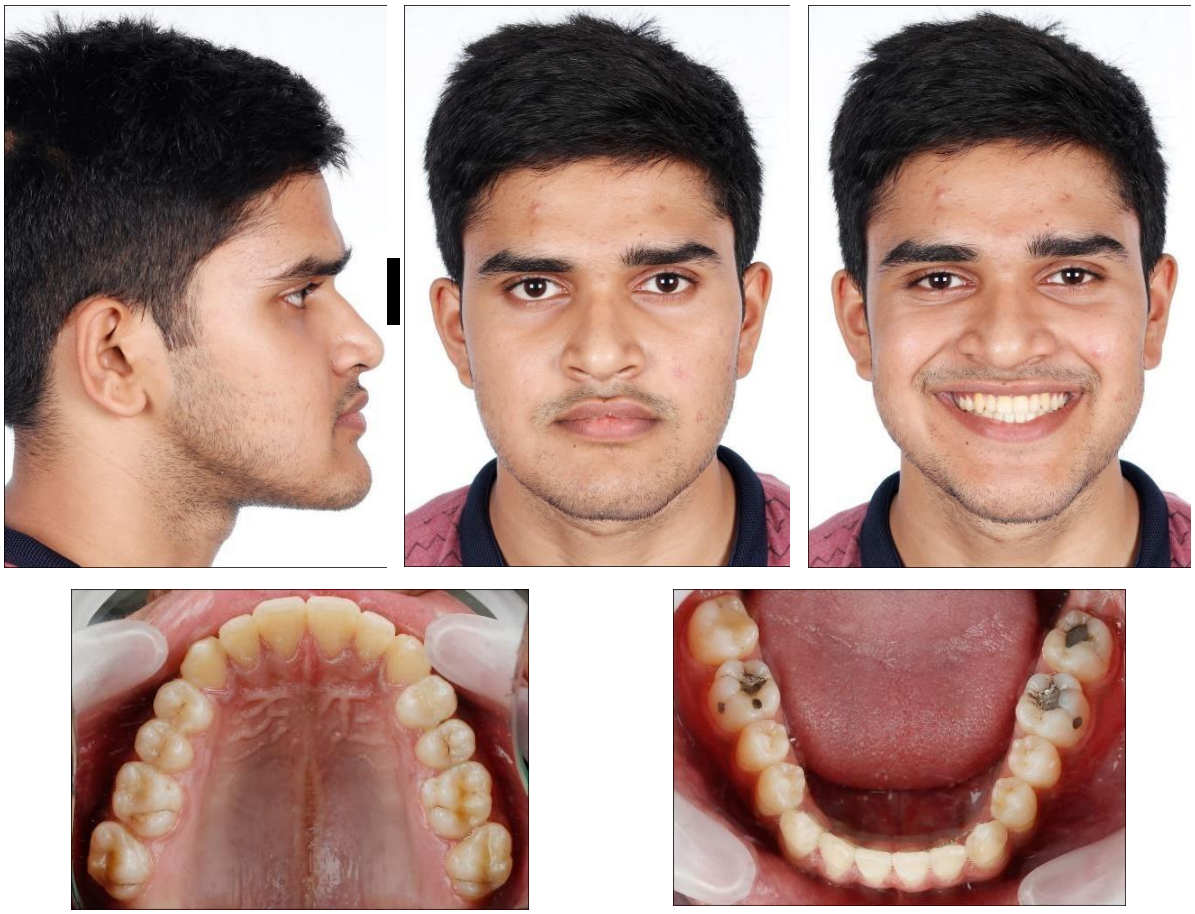


**Figure 10.** Post-debonding intra oral photographs, cephalogram and OPG.

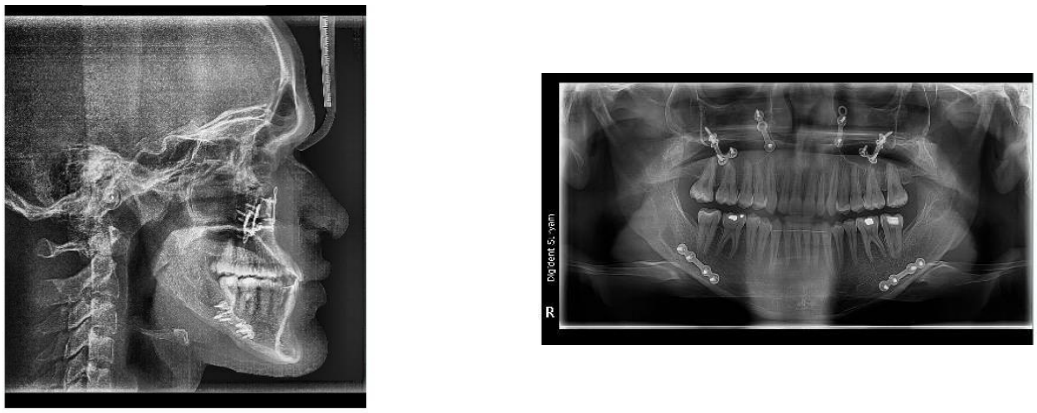
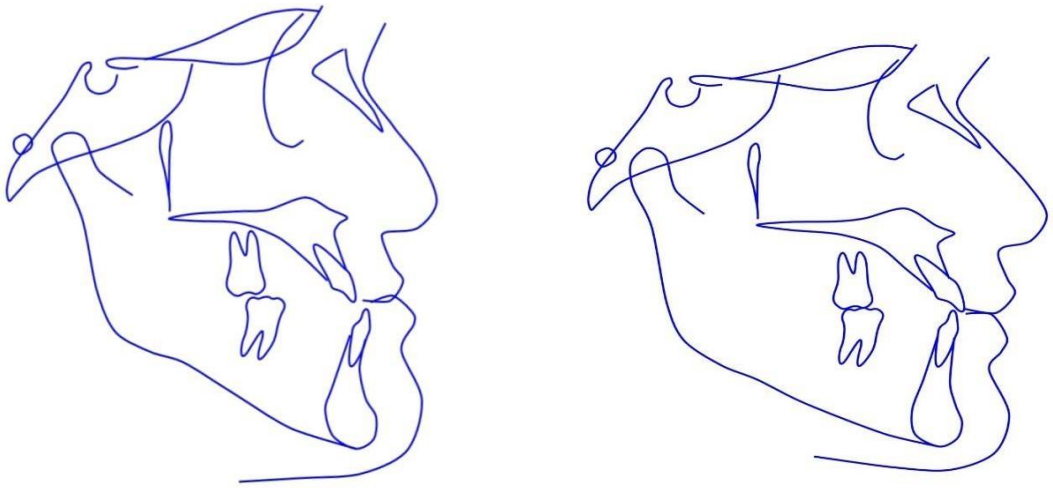


**Figure 10 Continue.** Post-debonding intraoral photographs, cephalogram and OPG.



(a) (b)

**Figure 11. (a) Pre-treatment cephalometric tracing. (b) Post-debonding cephalometric tracing**

**Table1. Cephalometric Analysis**

| Measurement | Pre-treatment value | Post-debonding value |
|---|---|---|
| SNA | 78° | 82° |
| SNB | 85° | 79° |
| ANB | -7° | 3° |
| Beta Angle* | 50° | 33° |
| IMPA | 82° | 79° |
| U1 to NA | 34° and 9 mm | 30° and 4 mm |
| L1 to NB | 24° and 5 mm | 23° and 4 mm |
| Y-axis | 68° | 65° |
| ANS-GN Vertical Distance | 67 mm | 62 mm |

* The angle formed between the A-B line and the perpendicular through point A from the apparent axis of the condyle.

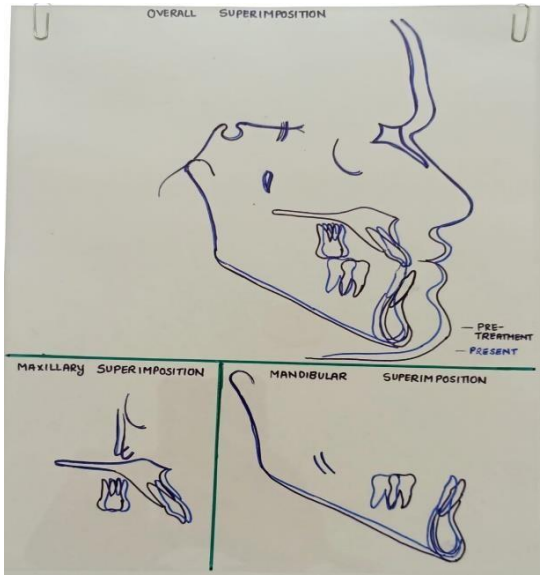



**Figure 12.** Pre-treatment and post-debonding cephalometric superimposition (Black: Pre-treatment, Blue: Post-debonding)

**Figure 13.** Comparison of profile view: pre-treatment, immediate post-surgery and post-debonding

**Figure 14.** 12-month follow up extra and intraoral photographs

**Figure 14 Continue.** 12-month follow up extra and intra oral photographs

## 4. Discussion

Nagasaka et al. (11) suggested the "surgery-first" approach that typically involves orthognathic surgery without presurgical orthodontic treatment. However, occlusal interference at the end of or during surgery poses a significant threat to the stability of the result. Correction of such interferences is an important and integral part of the presurgical orthodontic phase in both the conventional as well as the "surgery-first" approach. Conventional surgical orthodontic treatment recommends decompensations, and this would increase the existing discrepancy and worsen facial esthetics and oral functions. This may elicit a negative effect on a patient's psychological state. Moreover, compensated dentoalveolar segment is a physiological response to a skeletal discrepancy and any attempt to decompensate during presurgical orthodontics can be in contradiction of physiology. MPO or SFO improves the facial profile and esthetics very early in the treatment and induces the patient's satisfaction and confidence. This immensely helps in achieving patient cooperation during the postsurgical orthodontic phase. Furthermore, there can be a synergistic effect between the orthodontic force and the newly established adaptive force from soft tissues that would bring about physiological dentoalveolar decompensation (12,13). The patient had a concave facial profile with a marked mandibular prognathism and maxillary hypoplasia with an anterior open bite. Two jaw surgery was recommended to achieve greater change in the ANB and to correct the midfacial deficiency (14). To deal with skeletal relapse, rigid fixation and a chin-cap were used, which was advised for night time wear. Post-debonding 12-month follow-up images showed stable surgical results.

## Conclusion

Proper case selection is crucial for the MPO approach. With accurate diagnosis, MPO can provide an effective and efficient alternative to the conventional orthodontic-orthognathic treatment approach.

### *Informed consent*

The authors certify that they have obtained all appropriate patient consent forms. In the forms, the patient gave his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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Nil

### *CONFLICTS OF INTEREST*

There are no conflicts of interest.

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